Remarks

Support for the above-requested amendments to claim 1 is found at least at paragraph [0008] and in claim 15 as originally presented. Support for the amendments to claim 21 is found at least in paragraphs [0001], [0008], and [0011]. Claims 9, 16-20, and 22-26 were canceled in previous Amendments. No question of new matter arises and entry of the amendments is respectfully requested.

Claims 1-8, 10-15, and 21 are before the Examiner for consideration.

Rejection of Claims 1-8 and 10-15 under 35 U.S.C. §103(a)

Claims 1-8 and 10-15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over WO 2001/39954 to Grinshpun, *et al.* ("Grinshpun") in view of U.S. Patent Publication No. 2005/0027040 to Nelson, *et al.* ("Nelson"). The Examiner asserts that Grinshpun teaches a method of manufacturing a rigid foam that consists essentially of (1) incorporating fillers and at least one nucleating agent and reinforcing materials such as graphite, conductive carbon black, and nanofillers into a polymer, (2) incorporating a blowing agent into the melt under a first temperature and a first pressure, (3) extruding the polymer melt under a second temperature and second pressure to allow the polymer melt to expand and foam, and (4) cooling the foamed product. It is asserted that the foam has a cell size that ranges from 25-7000 microns. The Examiner admits that Grinshpun does not explicitly teach that the calcium carbonate employed either as a nucleating agent or as a filler/reinforcing material has a particle size in at least one dimension of less than 100 angstroms.

In this regard, Nelson is cited for assertedly disclosing a method where inorganic additives such as nanoparticles of calcium carbonate are combined with a resin to form nanocomposite additives for extrusion processes. It is also asserted that the calcium carbonate used to form the nanocomposite has a particle size as low as about 2 nm. Thus, the Examiner concludes that it would have been obvious to one of skill in the art to use the calcium carbonate nanocomposites taught by Nelson in the method of Grinshpun to improve the blendability of the additives and to improve the mechanical and thermal properties of the article to be produced.

In response to this rejection, Applicants respectfully direct the Examiner's attention to independent claim 1 and submit that claim 1 defines a method of manufacturing a rigid foam

board that is not taught or suggested within Grinshpun, either alone or in combination with Nelson. Additionally, Applicants respectfully submit that neither Grinshpun nor Nelson teaches or suggests the combination of features recited in amended claim 1.

Grinshpun teaches a foamable composition that is extruded through a die having a plurality of orifices, each of which forms a hollow extrudate. (*See, e.g.*, page 2, lines 19-21 and page 20, lines 22-24). The hollow extrudate is converted into foamed hollow extrudate strands at a temperature that promotes bubble stability. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). The final step includes permitting the hollow strands to contact and adhere to each other to form a hollow, multistrand polymer foam extrudate. (*See, e.g.*, page 2, lines 25-28 and page 20, lines 28-31). No where in Grinshpun is there any teaching or suggestion of extruding a polymer melt under a second pressure and at a second temperature where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board as is required in claim 1. Indeed, the extrusion die in Grinshpun is specifically chosen so that it forms hollow tubes, not a foam board. It is through a separate coalescing step that the hollow tubes are joined together. (*See, e.g.*, page 20, lines 28-31 of Grinshpun). There is simply no teaching or suggestion within Grinshpun of extruding a foam board as claimed in claim 1. Nelson is silent with respect to any teaching or suggestion of extruding a foam board, and as such, cannot make up for the deficiencies of Grinshpun. Accordingly, it is respectfully submitted that the combination of the teachings of Grinshpun and Nelson would not result in the inventive method of claim 1.

In addition, Applicants submit that Grinshpun teaches away from a method of manufacturing a rigid foam board that includes the step of extruding a polymer melt under a second pressure and at a second temperature that allow the polymer melt to expand and form a foam board. As discussed above, Grinshpun specifically teaches the extrusion of a hollow extrudate. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). There is simply no teaching or suggestion within Grinshpun of extruding a foam board. Applicants respectfully submit that one of skill in the art reading Grinshpun would be led away from extruding a polymer melt under a second pressure and at a second temperature which permits the polymer melt to expand and form a foam board as is claimed in claim 1. As discussed above Nelson cannot make up for the deficiencies of Grinshpun. As such, it is respectfully submitted that claim 1 is non-obvious and patentable for this additional reason.

Further, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at a method of manufacturing a rigid foam board based on the teachings of Grinshpun and Nelson. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would have no motivation to arrive at method for manufacturing a rigid foam board that consists essentially of (1) incorporating nano-particles selected from calcium carbonate, intercalated graphites and expanded graphites into a polymer melt where the nano-particles have a particle size in at least one dimension less than 100 angstroms and the polymer melt includes an alkenyl aromatic polymer material, (2) incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the foam board has an average cell size between 60 μm and 120 μm and a cell size distribution based on the teachings of Grinshpun and Nelson because Grinshpun specifically teaches the extrusion of a hollow extrudate. Indeed, Grinshpun teaches away from the method recited in claim 1. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

With respect to claims 2-8 and 10-15, Applicants submit that because independent claim 1 is not taught or suggested by Grinshpun or Nelson and claims 2-8 and 10-15 are dependent upon independent claim 1 and contain the same elements as claim 1, dependent claims 2-8 and 10-15 are also not taught or suggested by Grinshpun and/or Nelson.

In light of the above, Applicants submit that claims 1-8 and 10-15 are not obvious over Grinshpun in view of Nelson and respectfully request that this rejection be reconsidered and withdrawn.

Rejection of Claims 1-8, 10-12, 14 and 15 under 35 U.S.C. §103(a)

The Examiner has rejected claims 1-8, 10-12, 14, and 15 as being unpatentable over WO 2001/39954 to Grinshpun, *et al.* ("Grinshpun") in view of U.S. Patent No. 6,589,6456 to Morgenstern ("Morgenstern"). The Examiner asserts that Grinshpun teaches a method of manufacturing a rigid foam that consists essentially of (1) incorporating fillers and at least one nucleating agent and reinforcing materials such as graphite, conductive carbon black, and nanofillers into a polymer, (2) incorporating a blowing agent into the melt under a first temperature and a first pressure, (3) extruding the polymer melt under a second temperature and second pressure to allow the polymer melt to expand and foam, and (4) cooling the foamed product. It is asserted that the foam has a cell size that ranges from 25-7000 microns. The Examiner admits that Grinshpun does not explicitly teach that the calcium carbonate employed either as a nucleating agent or as a filler/reinforcing material has a particle size in at least one dimension of less than 100 angstroms. In this regard, the Examiner asserts that Morgenstern discloses that calcium carbonate having a particle size as low as 50 angstroms may be employed as an inorganic filler/nucleating agent in foam applications. The Examiner concludes that it would have been obvious to one of skill in the art to employ the calcium carbonate disclosed by Morgenstern for the purpose of employing an art recognized suitable and conventional nucleating agent to produce a foam product.

In response to this rejection, Applicants respectfully direct the Examiner's attention to independent claim 1 and submit that claim 1 defines a method of manufacturing a rigid foam board that is not taught or suggested within Grinshpun, either alone or in combination with Morgenstern. Additionally, Applicants respectfully submit that neither Grinshpun nor Morgenstern teaches or suggests the combination of features recited in amended claim 1.

Grinshpun teaches a foamable composition that is extruded through a die having a plurality of orifices, each of which forms a hollow extrudate. (*See, e.g.*, page 2, lines 19-21 and page 20, lines 22-24). The hollow extrudate is converted into foamed hollow extrudate strands at a temperature that promotes bubble stability. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). The final step includes permitting the hollow strands to contact and adhere to each other to form a hollow, multistrand polymer foam extrudate. (*See, e.g.*, page 2, lines 25-28 and page 20, lines 28-31). No where in Grinshpun is there any teaching or suggestion of extruding a polymer melt under a second pressure and at a second temperature where the second pressure and second temperature are sufficient to allow the polymer melt to

expand and form a foam board as is required in claim 1. Indeed, the extrusion die in Grinshpun is specifically chosen so that it forms hollow tubes, not a foam board. It is through a separate coalescing step that the hollow tubes are joined together. (*See, e.g.*, page 20, lines 28-31 of Grinshpun). There is simply no teaching or suggestion within Grinshpun of extruding a foam board as claimed in claim 1. Morgenstern is silent with respect to any teaching or suggestion of extruding a foam board, and as such, cannot make up for the deficiencies of Grinshpun. Accordingly, it is respectfully submitted that the combination of the teachings of Grinshpun and Morgenstern would not result in the inventive method of claim 1.

In addition, Applicants submit that Grinshpun teaches away from a method of manufacturing a rigid foam board that includes the step of extruding a polymer melt under a second pressure and at a second temperature that allows the polymer melt to expand and form a foam board. As discussed above, Grinshpun specifically teaches the extrusion of a hollow extrudate. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). There is simply no teaching or suggestion within Grinshpun of extruding a foam board. Applicants respectfully submit that one of skill in the art reading Grinshpun would be led away from extruding a polymer melt under a second pressure and at a second temperature which permits the polymer melt to expand and form a foam board as is claimed in claim 1. As discussed above Morgenstern cannot make up for the deficiencies of Grinshpun. As such, it is respectfully submitted that claim 1 is non-obvious and patentable for this additional reason.

Further, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at a method of manufacturing a rigid foam board based on the teachings of Grinshpun and Morgenstern. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would have no motivation to arrive at method for manufacturing a rigid foam board that consists essentially of (1) incorporating nano-particles selected from calcium carbonate, intercalated graphites and expanded graphites into a polymer melt where the nano-particles have a particle size in at least one dimension less than 100 angstroms and the polymer melt includes

an alkenyl aromatic polymer material, (2) incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the foam board has an average cell size between 60 μm and 120 μm and a cell size distribution based on the teachings of Grinshpun and Morgenstern because Grinshpun specifically teaches the extrusion of a hollow extrudate. Indeed, Grinshpun teaches away from the method recited in claim 1. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

With respect to claims 2-8, 10-12, 14, and 15, Applicants submit that because independent claim 1 is not taught or suggested by Grinshpun or Morgenstern and claims 2-8, 10-12, 14, and 15 are dependent upon independent claim 1 and contain the same elements as claim 1, dependent claims 2-8, 10-12, 14, and 15 are also not taught or suggested by Grinshpun and/or Morgenstern.

In light of the above, Applicants submit that claims 1-8, 10-12, 14, and 15 are not obvious over Grinshpun in view of Morgenstern and respectfully request that this rejection be reconsidered and withdrawn.

Rejection of Claims 1-8 and 10-15 under 35 U.S.C. §103(a)

The Examiner has rejected claims 1-8 and 10-15 as being unpatentable over WO 2001/40362 to Miller, *et al.* ("Miller") in view of U.S. Patent Publication No. 2005/0027040 to Nelson, *et al.* ("Nelson"). In particular, the Examiner asserts that Miller teaches the claimed process of producing an extruded rigid foam where a blowing agent is incorporated into the polymer melt at a first pressure and temperature, extruding the polymer melt under a second pressure and temperature to form a foam, and intrinsically cooling the foam to form a product with a cell size within the claimed range. It is asserted that the preferred polymer melt includes an alkenyl aromatic polymer material. The Examiner admits that Miller does not disclose the incorporation of nano-particles in the polymer melt.

In this regard, the Examiner asserts that Nelson teaches a method where inorganic additives such as nanoparticles of calcium carbonate are combined with a resin to form nanocomposite additives for extrusion processes. It is also asserted that the calcium

carbonate used to form the nanocomposite has a particle size as low as about 2 nm. Thus, the Examiner concludes that it would have been obvious to one of skill in the art to use the calcium carbonate nanocomposites taught by Nelson in the method of Grinshpun to improve the blendability of the additives and to improve the mechanical and thermal properties of the article to be produced.

In response to this rejection, Applicants respectfully direct the Examiner's attention to independent claim 1 and submit that claim 1 defines a method of manufacturing a rigid foam board that is not taught or suggested within Miller, either alone or in combination with Nelson. As amended, claim 1 defines a method of manufacturing a rigid foam board that consists essentially of (1) incorporating nano-particles selected from calcium carbonate, intercalated graphites and expanded graphites into a polymer melt, (2) incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the foam board has an average cell size between 60 μm and 120 μm and a cell size distribution. As described in MPEP §2111.03, the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials and those materials that "do not materially affect the basic and novel characteristics of the claimed invention."

Miller teaches the inclusion of titanium dioxide and talc in an extruded foam manufacturing process to reduce the oblong cell size shape in the z-axis and create rounder shaped cells compared to that of a corresponding foam without titanium dioxide and/or talc. (*See, e.g.*, page 2, lines 19-22 and page 4, line 31 to page 5, line 1). As taught in the specification, the inclusion of talc, a conventional inorganic nucleating agent, tends to create a median cell size more than 150 microns. (*See, e.g.*, paragraph [0010], paragraph [0029] (Example 1), and Table 2, where the comparison sample incorporated talc). As shown in Table 2, the foam that included talc had an average cell size of 186 microns. It is apparent from this example that the inclusion of talc produces a foam with an average cell size outside the claimed range of 60-120 microns. In the present application, Applicants have invented a method of manufacturing a rigid foam board utilizing nano-particles with a particle size in at least one dimension less than 100 angstroms to control the cell size and produce a rigid polymer foam having relatively small median cell size. (*See, e.g.*, paragraphs [0010] and

[0020]). Applicants submit that the inclusion of talc in the foam of Miller affects the basic and novel characteristics of the claimed invention. As such, it is submitted that independent claim 1 and all claims dependent therefrom, are non-anticipatory, non-obvious, and patentable.

In addition, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at a method of manufacturing a rigid foam board based on the teachings of Miller and Nelson. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would have no motivation to arrive at the inventive method of claim 1 based on the teachings of Miller and Nelson when Miller specifically teaches the inclusion of talc in the foamable gel. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

In light of the above, Applicants submit that claims 1-8 and 10-15 are not obvious over Miller in view of Nelson and respectfully request reconsideration and withdrawal of this rejection.

Rejection of Claims 1-8, 10-12, 14, 15, and 21 under 35 U.S.C. §103(a)

The Examiner has rejected claims 1-8, 10-12, 14-15, and 21 as being unpatentable over WO 2001/40362 to Miller, *et al.* ("Miller") in view of WO 2003/055804 to Chen, *et al.* ("Chen") and U.S. Patent No. 7,160,929 to Tan ("Tan"). In particular, the Examiner asserts that Miller teaches the claimed process of producing an extruded foam product where a blowing agent is incorporated into a polymer melt at a first pressure and temperature, extruding the polymer melt under a second pressure and temperature to form a foam, and intrinsically cooling the foam to form a product with a cell size within the claimed range. It is asserted that the preferred polymer melt includes an alkenyl aromatic polymer material. The Examiner admits that Miller does not teach acicular nano-particles as claimed.

In this regard, Chen is cited for assertedly disclosing calcium carbonate whiskers/needles that have a particle size as low as 10 nm (100 angstroms). Additionally, the

Examiner cites Tan for teaching the use of nanofibers and nanopowders such as calcium carbonate in the production of nanocomposite foams. The Examiner concludes that it would have been obvious to one of skill in the art to employ the calcium carbonates of either Chen or Tan in the method of Miller for the purpose of producing a lightweight material having superior mechanical properties.

In response to the rejection of claims 1-8, 10-12, and 14-15, Applicants respectfully direct the Examiner's attention to independent claim 1 and to the arguments set forth above with respect to the rejection of claims 1-8 and 10-15 under 35 U.S.C. §103(a) over Miller in view of Nelson and submit that claim 1 defines a method for manufacturing a rigid foam board that is not taught or suggested within Miller and Nelson. In addition, Applicants submit that the teachings of Chen and Tan do not add to the Examiner's rejection so as to make claim 1 unpatentable. Even with the addition of the teachings of Chen and Tan, Miller and Nelson still do not teach or suggest a method that consists essentially of (1) incorporating nano-particles selected from calcium carbonate, intercalated graphites and expanded graphites into a polymer melt where the nano-particles have a particle size in at least one dimension less than 100 angstroms and the polymer melt includes an alkenyl aromatic polymer material, (2) incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the foam board has an average cell size between 60 μm and 120 μm and a cell size distribution as claimed in amended claim 1. As such, it is submitted that the combination of Miller, Nelson, Chen, and Tan does not teach or suggest Applicants' invention as recited in claim 1.

In response the rejection of claim 21, Applicants respectfully direct the Examiner's attention to independent claim 21 and submit that claim 21 defines a method of manufacturing a rigid foam board that is not taught or suggested within Miller, either alone or in combination with Chen or Tan. As amended, claim 21 defines a method of manufacturing a rigid foam board that consists essentially of (1) incorporating acicular calcium carbonate and at least one nucleating agent into a polymer melt, where the acicular calcium carbonate has a particle size in at least one dimension less than 100 angstroms, (2) adding a blowing agent to the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second

pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the polymer melt includes and alkenyl aromatic polymer material and the foam has a cell orientation of at least about 1.4. As described in MPEP §2111.03, the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials and those materials that "do not materially affect the basic and novel characteristics of the claimed invention."

Miller teaches the inclusion of titanium dioxide and talc in an extruded foam manufacturing process to reduce the oblong cell size shape in the z-axis and create rounder shaped cells when compared to that of a corresponding foam without titanium dioxide and/or talc. (*See, e.g.*, page 2, lines 19-22 and page 4, line 31 to page 5, line 1). Miller further teaches that the extruded foams comprising titanium dioxide and talc have a cell orientation closer to 1.0. (*See, e.g.*, page 9, lines 7-8). As taught in the specification, foams produced with acicular nanosized calcium carbonate have an increased cell orientation of at least about 1.4. (*See, e.g.*, paragraph [0011] and Example 4 at paragraph [0031]). It is apparent from the teachings of Miller that the inclusion of titanium dioxide and talc produces a foam with a cell orientation outside the claimed amount of at least 1.4. In the present application, Applicants have invented a method of manufacturing a rigid foam board utilizing nano-particles to produce a rigid polymer foam having an increased cell orientation. (*See, e.g.*, paragraph [0011]). Applicants submit that the inclusion of titanium dioxide and talc in the foam of Miller affects the basic and novel characteristics of the claimed invention. As such, it is submitted that independent claim 21 and all claims dependent therefrom, are non-anticipatory, non-obvious, and patentable.

In addition, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at a method of manufacturing a rigid foam board based on the teachings of Miller, Chen, and Tan. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would not be motivated to arrive at the inventive method of claim 21 based on the teachings of Miller, Chen, and/or Tan when Miller specifically teaches the inclusion of titanium dioxide

and talc in the foamable gel, which creates a cell orientation of about 1.0. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

In light of the above, Applicants submit that claims 1-8, 10-12, 14-15, and 21 are not obvious over Miller in view of Chen and/or Tan and respectfully request that this rejection be reconsidered and withdrawn.

Rejection of Claims 1-8, 10-12, 14-15, and 21 under 35 U.S.C. §103(a)

The Examiner has rejected claims 1-8, 10-12, 14-15, and 21 as being unpatentable over WO 2001/39954 to Grinshpun, *et al.* ("Grinshpun") in view of WO 2003/055804 to Chen, *et al.* ("Chen") and U.S. Patent No. 7,160,929 to Tan ("Tan"). The Examiner asserts that Grinshpun teaches a method of manufacturing a rigid foam that includes (1) incorporating fillers and at least one nucleating agent and reinforcing materials such as graphite, conductive carbon black and nanofillers into a polymer, (2) incorporating a blowing agent into the melt under a first temperature and a first pressure, (3) extruding the polymer melt under a second temperature and second pressure to allow the polymer melt to expand and foam, and (4) cooling the foamed product. It is asserted that the foam has a cell size that ranges from 25-7000 microns. Grinshpun does not specify the shape or particle size of the fillers and reinforcing materials.

In this regard, Chen is cited for assertedly disclosing calcium carbonate whiskers/needles with a particle size as low as 10 nm (100 angstroms). In addition, the Examiner asserts that Tan teaches the use of nanofibers and nanopowders in the production of nanocomposite foams. The Examiner concludes that it would have been obvious to one of skill in the art to use a nanofiller, such as acicular calcium carbonate, with a particle size less than 100 angstroms in the method of Grinshpun as taught by Chen and Tan to produce a lightweight material with superior mechanical properties.

In response to the rejection of claims 1-8, 10-12, and 14-15, Applicants respectfully direct the Examiner's attention to independent claim 1 and to the arguments set forth above with respect to the rejection of claims 1-8 and 10-15 under 35 U.S.C. §103(a) over Grinshpun in view of Nelson and submit that claim 1 defines a method for manufacturing a rigid foam board that is not taught or suggested within Grinshpun and Nelson. In addition, Applicants submit that the teachings of Chen and Tan do not add to the Examiner's rejection so as to

make claim 1 unpatentable. Even with the addition of the teachings of Chen and Tan, Grinshpun (and Nelson) still do not teach or suggest a method that consists essentially of (1) incorporating nano-particles selected from calcium carbonate, intercalated graphites and expanded graphites into a polymer melt where the nano-particles have a particle size in at least one dimension less than 100 angstroms and the polymer melt includes an alkenyl aromatic polymer material, (2) incorporating a blowing agent into the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board, where the foam board has an average cell size between 60 μm and 120 μm and a cell size distribution as claimed in amended claim 1. As such, it is submitted that the combination of Grinshpun, Chen, and Tan does not teach or suggest Applicants' invention as recited in claim 1.

With respect to dependent claims 2-8, 10-12, and 14-15, Applicants submit that because independent claim 1 is not taught or suggested by Grinshpun, Chen, and Tan and claims 2-8, 10-12, and 14-15 are dependent upon independent claim 1 and contain the same elements as claim 1, dependent claims 2-8, 10-12, and 14-15 are also not taught by Grinshpun, Chen, and/or Tan.

Turning to the rejection of claim 21, Applicants respectfully direct the Examiner's attention to independent claim 21 and submit that claim 21 defines a method of manufacturing a rigid foam board that is not taught or suggested within Grinshpun, either alone or in combination with Chen, or Tan. Additionally, Applicants respectfully submit that none of Grinshpun, Chen, or Tan teaches or suggests the combination of features recited in amended claim 21.

Grinshpun teaches a foamable composition that is extruded through a die having a plurality of orifices, each of which forms a hollow extrudate. (*See, e.g.*, page 2, lines 19-21 and page 20, lines 22-24). The hollow extrudate is converted into foamed hollow extrudate strands at a temperature that promotes bubble stability. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). The final step includes permitting the hollow strands to contact and adhere to each other to form a hollow, multistrand polymer foam extrudate. (*See, e.g.*, page 2, lines 25-28 and page 20, lines 28-31). No where in Grinshpun is there any teaching or suggestion of extruding a polymer melt under a second pressure and at a second temperature

where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board as is required in claim 21. Indeed, the extrusion die in Grinshpun is specifically chosen so that it forms hollow tubes, not a foam board. It is through a separate coalescing step that the hollow tubes are joined together. (*See, e.g.*, page 20, lines 28-31 of Grinshpun). There is simply no teaching or suggestion within Grinshpun of extruding a foam board as claimed in claim 21. Chen and Tan are silent with respect to any teaching or suggestion of extruding a foam board, and as such, cannot make up for the deficiencies of Grinshpun. Accordingly, it is respectfully submitted that the combination of the teachings of Grinshpun, Chen, and Tan would not result in the inventive method of claim 21.

Additionally, Applicants submit that Grinshpun teaches away from a method of manufacturing a rigid foam board that includes the step of extruding a polymer melt under a second pressure and at a second temperature that allows the polymer melt to expand and form a foam board. As discussed above, Grinshpun specifically teaches the extrusion of a hollow extrudate. (*See, e.g.*, page 2, lines 22-24 and page 20, lines 26-28). There is simply no teaching or suggestion within Grinshpun of extruding a foam board. Applicants respectfully submit that one of skill in the art reading Grinshpun would be led away from extruding a polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board as is claimed in claim 21. As discussed previously, Chen and Tan cannot make up for the deficiencies of Grinshpun. As such, it is respectfully submitted that claim 21 is non-obvious and patentable for this additional reason.

Further, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at a method of manufacturing a rigid foam board based on the teachings of Grinshpun, Nelson, Chen, and Tan. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would have no motivation to arrive at method for manufacturing a rigid foam board that consists essentially of (1) incorporating acicular calcium carbonate and at least one

nucleating agent into a polymer melt, where the acicular calcium carbonate has a particle size in at least one dimension less than 100 angstroms, (2) adding a blowing agent to the polymer melt under a first pressure and at a first temperature, (3) extruding the polymer melt under a second pressure and at a second temperature, where the second pressure and second temperature are sufficient to allow the polymer melt to expand and form a foam board, and (4) cooling the foam board based on the teachings of Grinshpun, Chen, and Tan because Grinshpun specifically teaches the extrusion of a hollow extrudate. Indeed, Grinshpun teaches away from the method recited in claim 21. Chen and Tan cannot make up for the deficiencies of Grinshpun. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

In view of the above, Applicants submit that claims that claims 1-8, 10-12, 14-15, and 21 are obvious over Grinshpun, Chen, and/or Tan and respectfully request that the Examiner reconsider and withdraw this rejection.

Conclusion

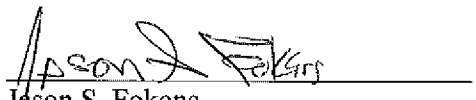
In light of the above, Applicants believe that this application is now in condition for allowance and therefore request favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 50-0568 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

Date: 9/4/08



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